

WHAT IS CLAIMED IS:

1. An ink-jet printing head comprising a cavity unit and an actuator which are superposed on each other,

wherein said cavity unit is a laminar structure including a plurality of plates superposed on each other in a vertical direction of said cavity unit, and has (a) a plurality of nozzles which are open in a surface thereof that is to be opposed to a print media and which are arranged in at least one row, (b) a plurality of pressure chambers which are arranged in a direction of said at least one row of said nozzles, (c) a plurality of communication passages for communication between the respective pressure chambers and the respective nozzles, and (d) a manifold portion which stores an ink supplied from an ink supply source and re-fills the pressure chambers,

wherein said actuator has a plurality of active portions which correspond to said pressure chambers, respectively, and which are selectively operable to eject the ink from the corresponding nozzles,

wherein said pressure chambers are arranged with a first spacing pitch between each adjacent pair of said pressure chambers, except at least one adjacent pair of said pressure chambers which are spaced apart from each other by a second spacing pitch that is larger than said first spacing pitch,

and wherein each of said communication passages includes at least one horizontally extending portion which extends in parallel with a horizontal direction of said cavity unit.

2. An ink-jet printing head according to claim 1, wherein said actuator includes of a plurality of mutually independent actuator units which are disposed such that end faces of each of at least one adjacent pair of said actuator units are opposed to each other in said direction of said at least one row of said nozzles, each of said actuator units having a length covering a predetermined number of said pressure chambers which are arranged in said direction of said at least one row of said nozzles,

and wherein said end faces of each of said at least one adjacent pair of said actuator units are located between a corresponding one of said at least one adjacent pair of said pressure chambers which are spaced apart from each other by said second spacing pitch.

3. An ink-jet printing head according to claim 1, wherein each of said communication passages consists of said at least one horizontally extending portion and at least one vertically extending portion which extends in parallel with said vertical direction of said cavity unit.

4. An ink-jet printing head according to claim 3, wherein each of said at least one horizontally extending portion is provided by a horizontally extending recess which is formed in a recess-defining plate that is one of said plates and which extends in a direction parallel to said recess-defining plate.

5. An ink-jet printing head according to claim 4, wherein each of said pressure chambers is elongated in a direction perpendicular to said direction of said at least one row of said nozzles, and is held in communication at a longitudinal end portion thereof with a corresponding one of said communication passages,

and wherein said horizontally extending recess has opposite end portions, one of which is aligned with said longitudinal end portion of a corresponding one of said pressure chambers in said vertical direction of said cavity unit, and the other of which is aligned with a corresponding one of said nozzles in said vertical direction.

6. An ink-jet printing head according to claim 4, wherein said pressure chambers include first and second pressure chambers which are alternately arranged in said direction of said at least one row of said nozzles,

wherein said communication passages include first and second communication passages which are alternately arranged in said direction of said at least one row of said nozzles, and which communicate with said first and second pressure chambers, respectively,

and wherein said recess providing each of said at least one horizontally extending portion of each of said first communication passages is formed in one of opposite surfaces of said recess-defining plate, while said recess providing each of

said at least one horizontally extending portion of each of said second communication passages is formed in the other of said opposite surfaces of said recess-defining plate.

7. An ink-jet printing head according to claim 6,
wherein said recess providing each of said at least one horizontally extending portion of each of said first communication passages has a first depth value, while said recess providing each of said at least one horizontally extending portion of each of said second communication passages has a second depth value,

and wherein a sum of said first depth value and said second depth value is smaller than a thickness value of said recess-defining plate.

8. An ink-jet printing head according to claim 4,
wherein said horizontally extending recess is formed in one of opposite surfaces of said recess-defining plate that is closer to said pressure chambers.

9. An ink-jet printing head according to claim 2,
wherein said plurality of mutually independent actuator units include two actuator units as said each of said at least one adjacent pair of said actuator units,

wherein said plurality of pressure chambers include two groups of pressure chambers which correspond to said two actuator units, respectively,

wherein said communication passages include two groups of communication passages which are held in communication with said two groups of pressure chambers, respectively,

and wherein the communication passages of one of said two groups and the communication passages of the other of said two groups are formed symmetrically with each other with respect to a plane which is parallel to said vertical direction and which is perpendicular to said direction of said at least one row of said nozzles.

10. An ink-jet printing head according to claim 4, wherein said pressure chambers are formed in a pressure-chamber-defining plate which is one of said plates and which is contiguous to said recess-defining plate.

11. An ink-jet printing head according to claim 4, wherein said pressure chambers are formed in a pressure-chamber-defining plate which is one of said plates, and wherein said recess-defining plate is interposed between said pressure-chamber-defining plate and at least one of said plates in which said manifold portion is formed.

12. An ink-jet printing head according to claim 1, wherein said nozzles arranged in each of said at least one row are spaced apart from each other by said first spacing pitch.

13. An ink-jet printing head according to claim 1,
wherein said nozzles are arranged in four rows,
and wherein said active portions of said actuators
are arranged in four rows each of which is parallel to a
corresponding one of said four rows of said nozzles.

14. An ink-jet printing head according to claim 3,
wherein each of said at least one horizontally extending portion
extends in a direction inclined with respect to said direction of
said at least one row of said nozzles.

15. An ink-jet printing head according to claim 5,
wherein one of said opposite end portions of said horizontally
extending recess is larger in area than the other.

16. An ink-jet printing head according to claim 7,
wherein said first and second communication passages which are
adjacent to each other overlap partially in a plan view of said
cavity unit.

17. An ink-jet printing head according to claim 1,
wherein said actuator includes a first piezoelectric
sheet formed with individual electrodes and a second
piezoelectric sheet formed with a common electrode, said first
and second piezoelectric sheets being superposed on each other,
and wherein said active portions are defined
between said individual electrodes and said common electrode.

18. An ink-jet printing head according to claim 1,
wherein said pressure chambers are arranged in two
rows in a zigzag pattern,

wherein said nozzles are arranged in two rows in a
zigzag pattern which are located between said two rows of said
pressure chambers,

and wherein said communication passages are
arranged in two rows in a zigzag pattern each of which is located
between a corresponding one of said two rows of said nozzles and
a corresponding one of said two rows of said pressure chambers.